CLAIM

I claim:

1. A balanced barrel-cam internal-combustion engine comprising:

    (a) a rotating barrel cylinder through which rotational power can be transmitted,

    (b) a plurality of p reciprocating piston-assemblies in uniformly spaced planetary arrangement about said rotating barrel cylinder, each that includes a piston head at one or both of the ends, a linear bearing segment to ensure exclusively rectilinear non-rotational motion of said piston-assembly, and a dual roller axial cam follower,

    (c) a plurality of engine valve-assemblies per said piston-assembly,

    (d) a restrained fixture equivalent to an engine block which houses said rotating barrel cylinder, said engine valve-assemblies, and said plurality of p reciprocating piston-assemblies,

    (e) a barrel-cam, also known as a conjugate axial cam, that is attached to the cylindrical surface of said rotating barrel cylinder, that compliments each said dual roller axial cam follower such that the said barrel-cam's displacement profile for each said piston-assembly has n oscillations per revolution of said rotating barrel cylinder and consists of a set, denoted as J, of 1st and any higher harmonics,

    such that for all j from said set of harmonics J as well as for said values of p and n, p is not a factor of the expressions $n \times j - 1$, $n \times j$, and $n \times j + 1$ whereby perfect balancing of aggregate piston-assembly forces and torques is achieved.

2. A balanced barrel-cam internal-combustion engine comprising:

    (a) a rotating barrel cylinder, a plurality of p reciprocating piston-assemblies, a plurality of engine valve-assemblies per said piston-assembly, and a restrained fixture, each as described in Claim 1,

    (b) a barrel-cam, also known as a conjugate axial cam, that is attached to the cylindrical surface of said rotating barrel cylinder, that compliments each said dual roller axial cam follower such that the said barrel-cam's displacement profile for each said piston-assembly has an even number of n oscillations per revolution of said rotating barrel cylinder and consists of a set of fixed perturbations in addition to a set, denoted as J, of 1st and any higher harmonics,

    such that for all j from said set of harmonics J as well as for said values of p and n, p is not a factor of the expressions $n \times j - 1$, $n \times j$, and $n \times j + 1$ whereby perfect balancing of aggregate piston-assembly forces and torques is achieved and furthermore such that the

said perturbations balance the valve-assembly forces in the direction of said piston-assembly motion without introducing additional torque imbalances.